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Classification and Advantages Parallel Computing in Process Computation : A Systematic Literature Review

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***Abstract*— Data Management requires computing devices that can perform data processes to form better information. With the development of data, the processor can be done with one unit only, over time required computing devices that have high performance. Parallel Computing is one of the techniques of doing computing simultaneously by utilizing several independent computers simultaneously. Parallel computers can be grouped according to the level at which hardware supports parallelism. This classification is generally analogous to the distance between basic computing nodes. This research will focus on looking at the widely used classification trends in this parallelism that affect the performance of these calculations. This study uses a systematic literature review to find many classifications in parallel computing. literature is taken from a reputable journal database is** ACM Digital Library, IEEE Xplore Digital Library, Science Direct, Emerald Insight. **The results of this study are mostly conducted in the United States and China so as to provide many contributions. classification of parallelism, mostly done in parallel computing include Distributed Parallel, Multi-Core Processor, Massively Parallel Computing, and Graph Processing Unit (GPU). In this study also illustrates the advantages in the application of computer parallel based on its classification. In essence the advantages in the application of computer parallel improve performance performance, as well as effective and efficiency in a process that is done**

Keywords; Parallel Computation, Parallel Computer, Process Computation, SLR

I. INTRODUCTION

The development of information technology increasingly rapidly, this affects the development of data needs that exist within an organization[1][2]. With the data used now more and more and more, it takes place and also the process of managing the data in order to make a useful information for the users[3]. This Data Management requires a computing device that can perform the data process to form better information. With the development of data, processors can be done with one unit only, over time required a computing device that has high performance[4], [5].

Then comes the parallel Computing which is one of the techniques of doing computing simultaneously by utilizing several independent computers simultaneously[6][7]. The motivation of this parallel computing[8], The more things that can be done simultaneously (in the same time), the more work that can be accomplished[2], [9], [10]. Performance is related to Performance measured by how much speed up (speed up) obtained by using parallel techniques.

The process of doing parallel computing is required parallel machine infrastructure consisting of many computers connected to the network available to work in parallel to solve one problem[1], [11], [12]. Parallel computers can be grouped according to the level at which hardware supports parallelism [13]. This classification is generally analogous to the distance between basic computing nodes. This study will focus on looking at the trends of the widely used classification in this parallelism affecting the performance of this computation.

II. METHODOLOGY

Systematic literature review is a literature review method that identifies, assesses, and interprets all findings on a research topic, to answer the predefined research question[14]. SLR method is carried out systematically by following the stages and protocols that allow the review literature process to avoid the bias and subjective understanding of the researcher. The SLR process is divided into several processes that include the search process, inclusion criteria and early exceptions, data extraction, and analysis of findings to answer research questions.

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A. Search process

The first process to be done in a systematic literature review (SLR) is to find and know the literature sources of consistent journals and lead to this study. Literature search uses journal databases of reputable, reliable, and widely used researchers as a reference. The journal source databases selected and used in this SLR are as follows:

1. ACM Digital Library (dl.acm.org)
2. IEEE Xplore Digital Library (http:/ieeexplore.ieee.org)
3. Science Direct (www.sciencedirect.com)
4. Emerald Insight (www.emeraldinsight.com)

This research uses boolean operators in the literature search process. this search process can filter the data better so the search gets more specific literature data. The boolean operators used are AND and OR. The composition used by the keyword is as follows:

1. ('Parallel' AND 'Computer') OR ((classification') OR ('algorithm'))
2. ('Parallel' AND 'Computer') OR ('algorithm')
3. ('Parallel' AND 'Computer') OR (classification')
4. ('Parallel' AND 'Computation') OR ((classification') OR ('algorithm'))

B. Inclusion and exclusion criteria

The inclusion criteria process is done in three screening processes including: "Study Found" This process is all documents found from the source of publication related to the specified keywords will be stored as Study Findings. "Candidate Study" Step filtering articles according to title and abstract, "Selected Study" The last part of this process filters the writing by reading thoroughly from all articles to answer research questions.

The validity of the literature in the exclusion criteria process has several provisions, namely:

1. Papers issued on the date of their publication (before 2001) and place of publication (journal and announcement except for important documents)
2. The complete article structure, which means all identities (journal/conference, author's identity, etc.) are available on paper.
3. Duplicate articles from the same study are not available on SLR

In addition, this SLR should concentrate on research to answer research questions

III. Data Extraction

The literature search was conducted in October 2017 and found 258 papers based on database sources and search keywords. First, 258 papers were found in "studies Found", after a "candidate studies" study of 121 articles were found with the appropriate abstract title and relevance of the study. after further studying articles derived from "candidate studies", there are only 42 papers that can be used to answer research questions.

TABLE I. NUMBER STUDIES IN SELECTED SOURCES

Source	Studies found	Candidate studies	Selected studies
ACM Press	50	24	5
Science direct	90	35	15
Emerald	40	25	6
IEEE	78	37	10
	258	121	36

IV. Result And Discussion

This research was conducted with the aim to know the tendency of parallel computer development in computer science. The use of Parallel computers has been tremendous so that it can pose new challenges in accelerating the use and efficiency of processes done within the computer. With Things That Happen So need to Look at the advantages of what I have developed on parallel computers. In this section, this paper presents demographic and literary trends of Selected Study literature, such as publication sources, publication years, the advantages of the classification of computer parallels.

From the literature that has been found 21 countries that contribute to parallel computer developments. country USA with 26 writers with 8 papers, and China with 18 writers with 8 papers which is a country that does a lot of research in this field. In detail can be seen in Figure 1.

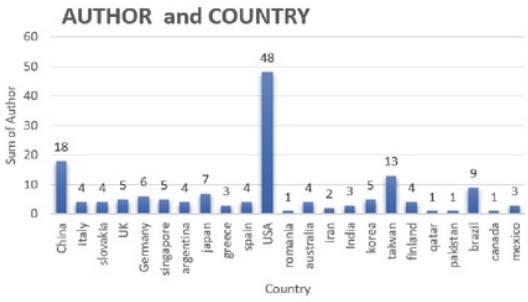

Fig. 1. Contribution Author, Paper, Country

Parallel computing research can be classified into several groups or methods. This can be seen in Figure 3, including Parallel Distributed computing, Multi-core Processor, Massively Parallel Computing, and Graph Processing Unit (GPU) which then followed by how many other groups.

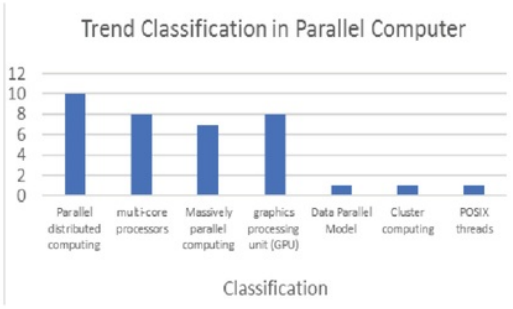

Fig. 2. Trend Classification Parallel Computer

Mapping Classification parallel computer based on literature, Following:

1. Parallel Distributed computing
   Parallel computing is a form of calculation that solves a problem by simultaneously using multiple computing resources that are in a number of nodes connected to each other[1], [15]. A well-distributed computation actually appears to analyze large amounts of data with a collection of computers within one network of the same node[2], [16].
2. Multi-core Processor
   Multi-core can be defined as a combination of two or more independent processors into an integrated circuit (IC)[17], [18]. From another sense, Multiprocessor or multi CPU is a system consisting of 2 or more CPU (Processor), in addition to each CPU on multiprocessor can be a multicore processor[19], [20].
3. Massively Parallel Computing
   A process form of collaborative processing of the same program by two or more processors. Each processor process handles various program threads, and each processor itself has a special operating system and memory[21].
4. Graph Processing Unit (GPU)
   GPU is a single chip processor with integrated transform, lighting, triangle setup/clipping, and rendering engine capable of performing a working process of at least 10 million polygons per second[22], [23]. "It became increasingly common to use a general purpose graphics processing unit (GPGPU) a modified form of a current processor (or vector processor), which runs a calculating kernel[24], [25].

TABLE II. ADVANTAGES OF CLASSIFICATION PARALLEL COMPUTING

Classification	Advantages	Reference
Parallel Distributed computing	Recource is used together	[1], [26], [27]
	A computation is divided into several sub computations and each subcomputation is done by each processor thereby increasing the speed of computing,	[28], [29], [30]
	Reliability, if a processor fails, then the processor can work on the process,	[31], [32], [33],
	Communication, enabling the transfer of data from a program to another program.	[15], [34], [29]
Multicore	Physically, multicore CPU design uses less space on PCB (Printed Circuit Board) than with multichip SMP design	[11], [35], [36]
	Dual-core processors use smaller resources than a pair of dual-core processors	[37], [38]
	Multicore designs have a lower risk of design error than single-core design	[39], [17]
	Improve the performance of the snoop cache operation (snooping bus). The snooping bus is a technique used in distributed memory distribution systems and multiprocessors aimed at obtaining cache coherence.	[37], [39], [17]
Cluster	More flexible(can upgrade according to ability)	[40]
	Simple for Manage Server	[40]
	High performance in many cases, proved to be more cost effective than mainframes with the same power	[40]
	its scalability can easily be expanded as a requirement change by adding additional nodes to the network	[40]
	operations can be simply transferred to other nodes in the cluster to ensure that there is no interruption in service	[40]
	Improve Network Technology	[40]
GPU	GPU has a architecture consisting of thousands of smaller and more efficient cores designed to handle multiple tasks simultaneously.	[23], [24],
	The performance of GPU has been shown to be much faster to proses	[25], [41], [24]
MPI	The ability to perform massive parallel operations.	[42], [43], [23]

Efficiency with good scale and up-scaling to solve problems	[23], [44]
Accelerate the process of an execution	[45],[46]
Superior in run-time performance and a much better scale	[47], [46]

V. Conclusion

The results of this Research many to do in the country USA and China many contributions. Classification parallelisme many doing in parallel Distributed computing, Multi-Core Processor, Massively Parallel Computing, and Graph Processing Unit (GPU) is a classification that became the trend of research in a parallel computer. Research in the field of parallel computer is a study that is still developing from time to time. In this results also illustrates the advantages in the application of computer parallel based on its classification. In essence the advantages in the application of computer parallel improve performance performance, as well as effective and efficiency in a process that is done. So the research in this field contributes greatly to computer science.

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